has likewise promised his co-operation in securing lunar photographs of the highest degree of excellence now attainable.

With the aid of these three prominent Observatories, which have given especial attention to the subject of lunar photography, it is proposed to prepare a volume representing upon a large scale the best results that can be secured, thus placing on record a detailed description of the lunar surface, the value of which for comparison with observations and photographs of the future can scarcely be over-estimated.

In furtherance of the plan for the establishment of standard sizes of screws and of diameters of tubing, &c., for astronomical and physical apparatus—a subject which has received the attention of Committees of the National Academy of Science, as also of the American Association for the Advancement of Science—a few standards have been tentatively adopted, and copies of these are attainable by all interested in securing uniformity in this class of work.

No memoir was added to the Smithsonian "Contributions to Knowledge" during the year, but a paper presenting an account of new experiments in aëro-dynamics by Prof. Langley was in course of preparation. These investigations were made at private charge, but it is in accordance with a policy long ago counselled by the Board of Regents that they should be published in a volume of the Institution's "Contributions."

A statement relating to the establishment of an Astro-physical Observatory as a part of the Smithsonian Institution has already appeared in NATURE (vol. xliv. p. 254). With regard to this Observatory, Prof. Langley recalls the fact that preparations for it had been made by the late Secretary, Prof. Baird. A special interest was taken in the proposed Astro-physical Observatory by the late Dr. J. H. Kidder, formerly Curator of Exchanges in the Smithsonian Institution, and the sum of 5000 dollars was received from his executors for this purpose. A like sum of 5000 dollars was presented personally to the Secretary by Dr. Alexander Graham Bell for prosecuting physical investigations, and particularly those upon radiant energy; and this sum was, with the consent and approval of the donor, placed to the credit of the Smithsonian Institution upon the same footing as the Kidder bequest. Congress was asked to appropriate 10,000 dollars for annual maintenance, and this sum was granted, and became available on July 1 last.

Speaking of the National Museum, Prof. Langley notes that at the close of the fiscal year the present building had been occupied one decade, and that during that period the total number of specimens of all kinds catalogued and ready for exhibition or study had increased from about 193,000 to more than 3,000,000. This rate of growth, as he says, is "probably unprecedented in the history of Museums." The development of the collections has not, however, proceeded "in such a symmetrical and consistent manner as is essential to the necessities of the work"; and such is the competition for "material," that the Museum is often unable to hold its own, not only with foreign Governments and with local Museums in other American cities, but even with private collectors. More space and a larger staff of curators are urgently needed.

Some interesting statements are made with regard to the work of the Bureau of Ethnology. At the close of the last fiscal year, specific exploration of the mound area by the United States ceased, except so far as it was found necessary to correct errors and supply omissions. A large part of the results of the work of several past years is in print, though not yet issued. A plan of general archæological field work has been practically initiated by a systematic exploration of the tide-water regions of the District of Columbia, Maryland, Virginia, and the Ohio Valley, which determined among other points of interest that the implication of great antiquity to forms of stone implements of America which have hitherto been classed with European palæoliths in age as well as in fabrication has not been substantiated by the ascertained facts.

Careful exploration of the Verde Valley in Arizona followed that before made of other parts of the large south-western region of the United States in which the presence of many extensive ruins has given rise to fanciful theories. The data as classified and discussed have shown that the hypothesis of a vanished race enjoying high civilization, which has been proposed to account for the architecture of the ruined structures is unnecessary.

The attention already given to Indian languages has been continued, in recognition of the fact that some of them are fast passing beyond the possibility of record and study, and that the ethnic classification of all of the Indian tribes can be made accurate only through the determination of their linguistic divisions and connections. The studies upon aboriginal mythology and religious practices have also been continued, with special attention to the ghost dances and "Messiah religion," which have produced important consequences bearing upon the problem of proper national dealing with the Indians. Official misconception of their religious philosophy, which has been forcedly transfigured by the absorption of Christianity so as to present more apparent than actual antagonism to civilization, has occasioned needless loss of life and treasure.

With regard to the National Zoological Park, Prof. Langley says the primary object for which Congress was asked to establish it was to secure the preservation of those American animals that are already nearly extinct, and this object it was thought would be best attained by the establishment of a large inclosure in which such animals could be kept in a seclusion as nearly as possible like that of their native haunts. Congress has been so unwilling to provide the necessary funds that the Smithsonian Institution has found it hard to realize the original design. Nevertheless, the development of the Park proceeded steadily during the year, as few changes as possible being made in its natural features. Trees have been planted in different parts, in some places for ornament, in others to secure the proper seclusion of animals; and a considerable area of open land has been prepared for lawn and pasture grounds. Near what is for the present the principal entrance is a disused quarry, from which arise precipitous cliffs and bold rocky ledges. It seemed particularly well fitted for the construction of dens and yards for bears. A series of caverns has been blasted in the rock and inclosed by a stout iron fence. Within the fence are large and commodious yards, in which have been constructed bathing pools, with water flowing constantly from a large spring outside the Park. The result has been a place admirably adapted for the health and general welfare of the animals, as well as a most picturesque and striking feature.

Already the establishment of a National Zoological Park under the management and guidance of the Smithsonian Institution has attracted the attention of similar institutions and of naturalists in other countries, and liberal offers of gifts and exchanges have been made.

From Sumatra, from the islands of the Pacific, from the shores of Alaska, and from American national parks, have come offers of gifts or terms of purchase, but it has been necessary to defer acceptance of all these offers owing to lack of funds even to pay for transportation.

SOCIETIES AND ACADEMIES.

LONDON.

Chemical Society, December 17, 1891.—Dr. W. H. Perkin, F.R.S., Vice-President, in the chair.—The following papers were read:—The composition of cooked vegetables, by Miss K. I. Williams. The vegetables examined after cooking were the artichoke (Jerusalem), broad bean, haricot bean, beetroot, cabbage, carrot, cauliflower, celery, cucumber, lettuce, mushroom, onion (Spanish), parsnip, pea (green), potato, radish, salsafy, scarlet-runner, sea-kale, spinach, tomato, turnip, and vegetable marrow. Ultimate analyses of the cooked vegetables were made, and their heats of combustion determined. The woody fibre, cellulose, fat, and the carbohydrates convertible into glucose were also estimated.—Metallic hydrosulphides, by S. E. Linder and H. Picton. The authors have investigated the sulphides of copper, mercury, arsenic, antimony, cadmium, zinc, bismuth, silver, indium, and gold; and find that, with the single exception of bismuth, all these metals form hydrosulphides of a more or less complicated character. These compounds, when treated with acids, in most cases lose part of their sulphuretted hydrogen, and form still more complicated hydrosulphides. Copper forms a soluble hydrosulphide possessing the composition $7CuS,H_2S$; this, on treatment with acetic acid in presence of excess of sulphuretted hydrogen, yields a substance of the composition $9CuS,H_2S$; if no excess of sulphuretted hydrogen be present, the compound $22CuS,H_2S$ is obtained. Hydrochloric acid produces still further condensation. Mercuric sulphide forms products approximately represented by the formulæ $31HgS,H_2S$ and $62HgS,H_2S$. The latter formula represents the substance obtained in presence of acid, and is a very stable substance. Zinc sulphide solution obtained from the hydroxide contains about 14 per cent. excess of sulphur as sulphuretted hydrogen; in presence of acetic acid a product represented approximately by the formula $12ZnS,H_2S$ is obtained. The authors consider that their results support the conclusion that the metallic sulphides are in most cases polymerides of very high molecular weight.—The physical constitution of some sulphide solutions, by H. Picton. The author has specially examined the solutions of mercuric, antimonious, and arsenious sulphides, and finds that in each case the sulphide is present in the form of very finely divided particles. In the "solution" of mercuric sulphide particles are visible under the microscope with a magnifying power of 1000 diameters, and are not diffusible even in the absence of a membrane. Arsenious sulphide may exist in "solution" in three distinct types of subdivision. In the first solution, the particles are just visible. In the second, the particles are smaller but not diffusible, and scatter and polarize a beam of light sent through the solution. The third solution is diffusible in the absence of a membrane, but the optical behaviour shows that particles really exist in the solution.—Solution and pseudo-solution, Part I., by H. Picton and S. E. Linder. The authors consider that there is a continuous series of grades of solutions passing without break from a crystallizable solution to one containing the substance in a state of fine subdivision. They regard the very finely divided particles in the lower grades of solutions—colloid solutions—as large molecular aggregates retaining many of their molecular properties. On passing up through the different grades of solution, the particles become smaller, and the forces holding them in solution become more definitely those of chemical attraction. A new property is described, which holds for a large range of solutions extending from pseudo-solutions to crystallizable solutions. This property consists in the repulsion of the dissolved substance as a whole from one of the electrodes of a battery immersed in the solution. Thus, in the case of colloidal arsenic sulphide, the sulphide aggregates are repelled from the negative electrode; they are also repelled, though much less strongly, from the positive electrode. An exactly similar phenomenon is observed in the case of the crystallizable colouring-matter Magdala-red when dissolved in absolute alcohol, the repulsion being, however, from the positive electrode, no perceptible repulsion from the negative electrode being observable. This property is of much interest in itself, but also as exhibiting similarities between the different grades of solution.—The change proceeding in an acidified solution of sodium thiosulphate when the products are retained within the system, by A. Colefax. The action of acids on sodium thiosulphate was investigated by allowing the action to proceed for a known time, then titrating with standard iodine solution, and subsequently determining the amount of acidity of the solution. The author concludes that the change proceeding in an acidified solution of sodium thiosulphate, when the products, viz. sulphurous acid and sulphur, are retained in the system, is a reversible one, a limit being reached a certain time from the time of acidification. The value of this limit is affected by the state of concentration, the ratio of the mass of acid relatively to the sodium thiosulphate, the nature of the acidifying acid, and the temperature. Sulphurous acid cannot prevent the decomposition of thiosulphuric acid. The presence of both products of the change in the system seems essential to the attainment of a limit value, for sulphurous acid, when initially free in the system at the time of acidification, has but little influence upon the values expressing the extent of the chemical change. A higher temperature favours the interaction of sulphurous acid and hydrogen and sodium thiosulphates; but this is a secondary change, which proceeds at lower temperatures with extreme slowness. Spring's statement that sodium trithionate is formed by the interaction of iodine, sodium sulphite, and sodium thiosulphate, seems to be wrong: the author finds that on adding a solution of these two salts to one of iodine no sodium trithionate is produced; the sodium sulphite is completely oxidized to sulphate.—The action of sulphurous acid on flowers of sulphur, by A. Colefax. Contrary to the statement of Debus, sulphurous acid acts on flowers of sulphur at the ordinary temperature, producing thiosulphuric acid and a polythionic acid, probably trithionic acid; no pentathionic acid was found. The action occurs even in the dark, and proceeds much more rapidly at a temperature of 80°–90°. Water has no action on flowers of sulphur, either at ordinary temperatures or at this higher temperature.—The α and β modifications of chlorobenzene hexachloride, by F. E. Matthews. A mixture of these two substances with oily products is obtained by passing chlorine gas through chlorobenzene in presence of dilute caustic soda. They are both colourless crystalline substances, which on heating, either alone or with alcoholic potash, give a quantitative yield of 1 : 3 : 4 : 5 tetrachlorobenzene. The β modification of chlorobenzene hexachloride, $C_6H_5Cl_7$, melts at about 260°, and is more stable and less volatile with steam than the α compound, which melts at about 146°.—The sulphochlorides of the isomeric dibromonaphthalenes, by H. E. Armstrong and E. C. Rossiter. The sulphochlorides of five of the dibromonaphthalenes have been investigated. It is to be noted that, while the dibromonaphthalenes all have higher melting-points than the corresponding dichloro-derivatives, no such relation holds between the sulphochlorides of corresponding dichloro- and dibromonaphthalenes.—The action of alcohols on sulphonic chlorides as a means of producing ethereal salts of sulphonic acids, by H. E. Armstrong and E. C. Rossiter. The authors find that the ethereal salts of several but not all of the dibromonaphthalenesulphochlorides may be prepared by simply boiling them with dehydrated alcohol.—The action of bromine on α and β bromonaphthalene, by H. E. Armstrong and E. C. Rossiter. The authors have succeeded in resolving into its constituents the mixture of dibromonaphthalenes obtained on brominating naphthalene with two molecular proportions of bromine.—The action of bromine on a mixture of ortho- and paranitro-α-acenaphthalide, by H. E. Armstrong and E. C. Rossiter. When a mixture of ortho- and paranitro-acenaphthalides is brominated, the ortho-compound, not the para-, as previously supposed, is alone attacked.—Camphrone, a product of the action of dehydrating agents on camphor, by H. E. Armstrong and F. S. Kipping. Several chemists have described camphorone, $C_9H_{14}O$, as a product of the action of sulphuric acid on camphor; the properties of this substance, however, as given by different chemists, show great variations. The authors, on preparing the substance and purifying it by means of its hydrazone, find its composition to be, not $C_9H_{14}O$, but probably $C_{10}H_{12}O$.—Metaxylenesulphonic acids, Part II., by G. T. Moody. When acetmetaxylid (1 : 3 : 4) is sulphonated, metaxylidinesulphonic acid ($Me_2 : NH_2 : SO_3H = 1 : 3 : 4 : 6$) is obtained in slender needles soluble in water. On diazotizing, and boiling with alcohol, it yields ethoxymetaxylenesulphonic acid; if the diazo-compound be boiled with hydrobromic acid, the corresponding bromoxylene-sulphonic acid is obtained in slender needles. The salts of the above acids are described.—The action of propylene bromide on the sodium derivatives of ethylic acetoacetate and ethylic benzoylacetate, by W. H. Perkin, Jun., and J. Stenhouse. The preparation and properties of the ethyl salts of acetylmethyltrimethylenecarboxylic acid, methyldiacetyldiadipic acid, and benzoylmethyltrimethylenecarboxylic acid, and their derivatives, are described.—Derivatives of tetramethylene, by W. H. Perkin, Jun., and W. Sinclair. The authors have prepared the monobromo-derivative of tetramethylenecarboxylic acid. Its hydroxy-, acetoxy-, and ethoxy-acids are also described, together with tetramethylene, methyl, and ethyl ketones and their reduction products.

Geological Society, December 23, 1891.—W. H. Hudleston, F.R.S., Vice-President, in the chair.—The following communications were read:—On part of the pelvis of *Polacanthus*, by R. Lydekker.—On the gravels on the south of the Thames from Guildford to Newbury, by Horace W. Monckton. The author stated that the greater part of the hill-gravel in the district referred to belonged to the Southern Drift of Prof. Prestwich, and that the valley-gravels for the most part consisted of material derived from the Southern Drift. Small patches of Westleton Shingle and Glacial Gravel occurred near Reading and Twyford. He divided the Southern Drift into three classes:—(1) Upper Hale type, characterized by the abundance of small quartz pebbles and the scarcity of chert. (2) Chobham Ridges type, with abundance both of small quartz pebbles and chert. (3) Silchester type; quartz scarce, and chert very rare or altogether absent. He described the localities at which these types occurred and their limits of distribution, and then referred to the Glacial Gravels of the Tilehurst plateau, which he believed to have been deposited before the excavation of the valley of the Thames between Reading and Goring. The author then dealt with the valley-gravels, which he believed to be mainly derived from the hill-gravels of the immediate neighbourhood, and showed how the various types of hill-gravel had contributed materials for the valley-gravels. He explained that, with the possible exception of the Westleton Shingle, he entirely rejected the theory of marine action in connection with the formation of these gravels, and thought that the Glacial Gravels were probably for the most part due to floods during melting of large quantities of ice. The remaining gravels, he believed, had been spread out by water in valleys; as denudation proceeded, the gravel, by protecting the ground upon which it lay, came to stand out as the capping of the plateaux and hills; as the gravel itself was denuded, the materials were carried to lower levels, forming new gravels; and this process has been repeated up to the present time. He explained that Prof. Rupert Jones and Dr. Irving had already adopted this theory in part, but that he differed from them in the entire exclusion of marine action. After the reading of this paper there was a discussion, in which the Chairman, Mr. W. Whitaker, Dr. Hicks, Mr. R. S. Herries, Prof. Grenville Cole, and Mr. Monckton took part.—The Bagshot Beds of Bagshot Heath, by Horace W. Monckton.

Paris.

Academy of Sciences, January 4.—M. Duchartre in the chair.—On an abnormal mode of propagation of waves, by M. H. Poincaré.—Remarks on the mechanism of the fixation of nitrogen by the soil and plants, *à propos* of a reply by MM. Schlœsing and Laurent, by MM. Arm. Gautier and R. Drouin.—Note on the late Herr Kronecker, by M. Hermite. This is an obituary notice on Herr Kronecker, the renowned mathematician, who died at Berlin on December 29, 1891, after a short illness.—On electro-capillary phenomena and differences of potential produced by contact, by M. Gouy. In order to obtain some new information as to contact force, the author has measured the surface tensions of more or less polarized liquid amalgams, in comparison with mercury. The first experiments were made with amalgams containing 1/1000 part of zinc, cadmium, lead, tin, bismuth, silver, and gold. And the results lead to the provisional statement that in a system consisting of non-polarized mercury, acidulated water, and an amalgam of 1/1000 more or less polarized, the superficial tension of the amalgam is a function of the apparent difference of potential between the amalgam and the mercury.—The direct combination of nitrogen with the alkaline-earthy metals, by M. Maquenne. The metals employed have been used under the form of electrolytic amalgams. They unite rapidly with nitrogen when heated in a current of that gas, in the absence of carbon and its compounds; there is thus no intermediate formation of a metallic carbide. The ease with which the combination takes place may lead to a new interpretation of the synthesis of alkaline-earthy cyanides by the simultaneous action of nitrogen and carbon on the corresponding bases.—Nitration of hydrocarbons of the methane series, by M. Konovaloff. The normal hydrocarbons of the methane series may be nitrated by weak nitric acid, and give as principal products secondary nitro compounds. The yields are relatively good, and the method may be used to prepare secondary nitro-paraffins. Corresponding amines and ketones are obtained by reduction of these products.—On the embryogeny of *Sagitta*, by M. S. Jourdain.—Influences of electric discharge during thunderstorms on apparatus registering terrestrial magnetism, by M. Em. Marchand. An examination of the tracings drawn by the registering magnetometers at Lyons Observatory since 1887, and the records of thunderstorms, establish a connection between lightning discharge and magnetic disturbances which has been frequently noted. Seventy-three lightning discharges had their time of occurrence and approximate distance recorded during the last five years. Forty of these were accompanied by well-marked disturbances of the declination curve; in fifteen cases the oscillatory movements were slight, but could be easily found when the time of discharge was known; thirteen cases were doubtful; and in five cases absolutely no trace of an abnormal oscillation could be detected. No simple relation appears to exist between the distance of the discharge and the amplitude of the oscillation they produce. Some very violent thunder-claps have only been accompanied by slight magnetic perturbations, whilst others, far more feeble and distant, have produced very large ones.—On the absolute values of the magnetic elements on January 1, 1892, by M. Th. Moureaux. The following are the values at the Parc Saint-Maur Observatory, deduced from the mean of the horary observations obtained on December 31, 1891, and January 1, 1892, and referred to the absolute measures made on December 27, 29, and 31, and on January 2:—

Elements.		Absolute values on January 1, 1892.		Secular variation in 1891.
Declination	... ...	15° 30′·7	...	−5′·2
Inclination	... ...	65° 9′·0	...	−1′·6
Horizontal force	...	0·19580	...	+0·00026
Vertical force	... ...	0·42278	...	+0·00006
Total force	.. ...	0·46592	...	+0·00016

—On the soundings of the Bourget Lake, and some other lakes in the Alps and the Jura, by M. A. Delebecque.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

Books.—Elements of Agriculture: Dr. W. Fream (Murray)—Annuaire, 1892, par le Bureau des Longitudes, Paris (Gauthier-Villars).—Monograph of the British Cicadæ, Part 8: G. B. Buckton (Macmillan).—Richard Wiseman: Surgeon-General Sir T. Longmore (Longmans).—U.S. Commission of Fish and Fisheries; Part xv., Report of the Commissioner for 1887 (Washington)—Observations made at the Blue Hill Meteorological Observatory, Mass., U.S.A., in the Year 1890 (Camb., Mass., Wilson).—Nature's Fairy-Land: H. W. S. Worsley-Benison; 4th edition (E. Stock).—A Cyclopædia of Nature Teachings (E. Stock).—A Treatise on the Ligation of the Great Arteries in Continuity: C. A. Ballance and W. Edmunds (Macmillan).—Rand, McNally, and Co.'s Indexed County and Railroad Pocket Maps and Shippers' Guides of Connecticut, Massachusetts, Pennsylvania, and Washington (Stanford).—Guide to the Examinations in Magnetism and Electricity, and Answers to Questions: W. J. Harrison (Blackie).—The Universal Atlas, Part 10 (Cassell).

Pamphlet.—The Evolution of Mind in Man: H. B. Medlicott (Kegan Paul).

Serials.—Bulletin of the N.Y. Mathematical Society, vol. i., Nos. 2 and 3 (New York).—Journal of the Asiatic Society of Bengal, vol. lix., Part 2, 1890; Supplement No. 2 (Calcutta).—La Nuova Scienza, vol. vi. fasc. v. (Todi, Umbria).—Journal of the College of Science, Imperial University of Japan, vol. iv. Part 2 (Tōkyō).—Zeitschrift für wissenschaftliche Zoologie, liii. Band, 2 Heft (Williams and Norgate).—Notes from the Leyden Museum, vol. xiii. Nos. 3 and 4 (Williams and Norgate).—The Record of Technical and Secondary Education, No. 2 (Macmillan).—Journal of Physiology, vol. xii., Nos. 5 and 6 (Cambridge).—Journal of the Royal Microscopical Society, December (Williams and Norgate).

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